FLOOD INSURANCE STUDY

BUTLER COUNTY, KENTUCKY

UNINCORPORATED AREAS

JUNE 5, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER -210029

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	2
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	2
	2.4 Flood Protection Measures	2
3.0	ENGINEERING METHODS	4
	3.1 Hydrologic Analyses	4
	3.2 Hydraulic Analyses	5
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	6
	4.1 Floodplain Boundaries	6
	4.2 Floodways	6
5.0	INSURANCE APPLICATION	7
6.0	FLOOD INSURANCE RATE MAP	7
7.0	OTHER STUDIES	7
8.0	LOCATION OF DATA	8
9.0	REFERENCES AND BIBLIOGRAPHY	8

TABLE OF CONTENTS (continued)

Page

FIGURE

Figure 1 - Vicinity Map 3

TABLE

Table 1 - Summary of Discharges 5

EXHIBITS

Flood Profiles

Green River Panels 01P-06P

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

BUTLER COUNTY,
UNINCORPORATED AREAS,
KENTUCKY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and supersedes a previous Flood Insurance Rate Map for the Unincorporated Areas of Butler County, Kentucky (Reference 1). This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared originally for purposes other than the National Flood Insurance Program. The data were identified as applicable at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. The Federal Emergency Management Agency (FEMA) performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from unpublished data provided by the U.S. Army Corps of Engineers (COE), Louisville District (Reference 2).

1.3 Coordination

On June 16, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Butler County, Kentucky. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data.

Flooding caused by overflow of the Green River was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Insurance Rate Map for Butler County, Kentucky (Reference 1) and are incorporated into this Flood Insurance Study.

2.2 Community Description

Butler County is in west-central Kentucky. The largest city in the county is the City of Morgantown, the county seat. The county is served by U.S. Route 231, State Routes 70 and 79, and the Green River Parkway. The 1980 population of Butler County, which is predominately rural, was reported to be 11,064 (Reference 3).

2.3 Principal Flood Problems

Due to the parameters of this existing data study, information regarding flooding problems in the community is obtained only from the source report (Reference 2) and any other readily available source. None of these sources provided information relating to the flooding problems in the community.

2.4 Flood Protection Measures

Two locks on the Green River, Lock No. 4, near the City of Woodbury, and Lock No. 5 near the eastern border of Butler County, are within the county. Upstream of Butler County are four flood control structures that form Green, Nolin, Barren, and Rough River Lakes. Although some benefits may accrue to areas of Butler County during small-scale storms, these facilities do not provide protection from major floods such as the 100-year event.

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Discharge-frequency values were developed from recorded data from 12 gaged locations within the Green River basin. During the periods of record used, the Green, Nolin, Barren, and Rough River Lakes were formed by flood control structures. Record data that reflected the existence of these lakes, all of which are located outside Butler County, were adjusted prior to inclusion with data from earlier years for the existing conditions analysis.

Final existing conditions (modified) discharge-frequency curves were developed through paper operation, October 1939 to date, of the four lake projects. Resultant lake holdouts were routed through each gage location to determine the modified annual events. The final modified discharge-frequency values for the Green River study reach were based on analyses of four gages on the Green River and two gages on the Rough River (located in Ohio County). Pertinent discharge values for the Green River were taken from the relationship developed using these gages. This study provided frequency-discharges versus drainage area relationships based on similar hydrologic characteristics.

Bulletin No. 17B (Reference 4) guidelines were used for the above studies. The final discharge versus drainage area relationships were determined by considering the omission of low and high outliers, weighting with the generalized skew, and adjusting to agree more closely with historical floods where possible.

Peak discharge-drainage area relationships for the 100-year flood of the Green River are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
GREEN RIVER		
at Lock 4 at City of Woodbury	5,404	99,000
at Lock 6 at City of Brownsville	2,762	62,900

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections were obtained from field measurement and supplemented by aerial photographic mapping with contour intervals of 10 and 20 feet (Reference 5). All bridges and culverts were field surveyed to obtain elevations and structural geometry. Water-surface profiles were developed using the HEC-2 step-backwater computer model (Reference 6). Profiles were determined for the 100-year flood and calibrated against known flood profiles. Profiles were also developed for the 10-, 50-, and 500-year floods, but no adjustments for known high-water marks were made..

Roughness coefficients (Manning's "n") depend on such factors as type and amount of vegetation, channel configuration, and water depth. Field inspection at each cross section provided estimated values. In conjunction with this approach, known roughness factors for comparable streams in adjacent watersheds were considered. In addition, 1950, 1962, and 1974 flood high-water marks for the Green River were reproduced to verify the roughness values, which ranged from 0.035 to 0.040 for the channel and were set at 0.07 for the overbanks.

The starting water-surface elevations for the Green River were taken from the COE study (Reference 2).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with contour intervals of 10 and 20 feet (Reference 5).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Insurance Rate Map for Butler County, Kentucky (Reference 1).

4.2 Floodways

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways have not been shown or computed for this community. Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100- year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study published for Warren County, Kentucky (Reference 7) and the Flood Insurance Study in progress for Ohio County, Kentucky (Reference 8) are in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Insurance Rate Map for Butler County (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Rate Map, Butler County, Unincorporated Areas, Kentucky, July 1986.

2. U.S. Army Corps of Engineers, Louisville District, Unpublished Data of the Hydraulic Analysis of the Green River in Butler County, Kentucky, under the authority of the COE Planning Assistance to States Program, Section 22, Water Resources Development Act of 1974, November 1986.

3. U.S. Department of Commerce, Bureau of the Census, 1960 Census of Population, Number of Inhabitants, Kentucky, Washington, D.C., February 1982.

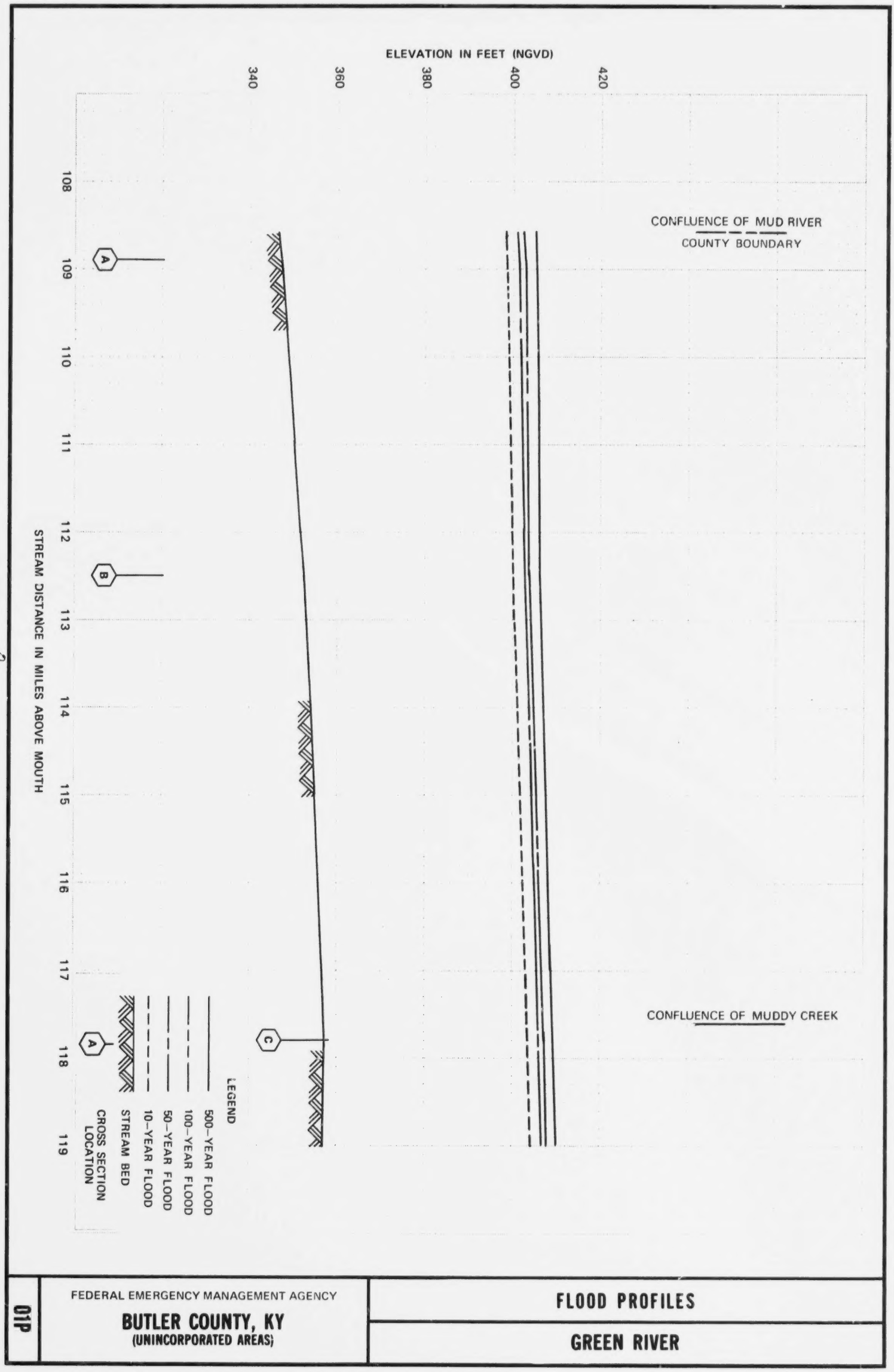
4. U.S. Department of the Interior, Geological Survey, Interagency Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

5. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 Feet: Cromwell, Kentucky, 1971; Rochester, Kentucky, 1953; South Hill, Kentucky, 1953; Morgantown, Kentucky, 1973; and Riverside, Kentucky, 1954; Contour Interval 20 Feet: Flener, Kentucky, 1973; and Reedyville, Kentucky, 1954.

6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Computer Program 723-X6-202A, Davis, California, April 1984.

7. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Warren County, Unincorporated Areas, Kentucky, November 1980.

8. ————, Flood Insurance Study, Ohio County and Incorporated Areas, Kentucky, in progress.



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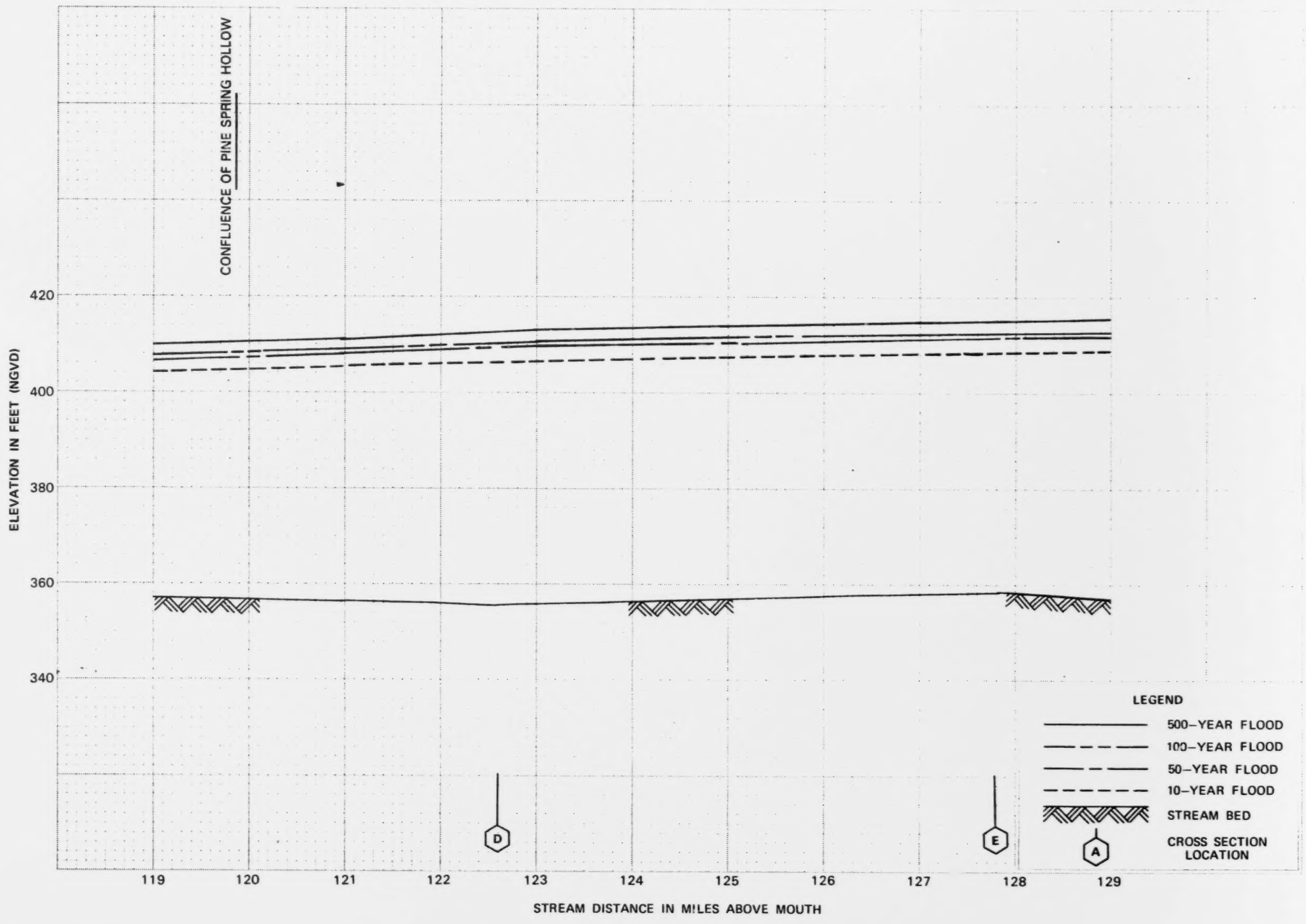


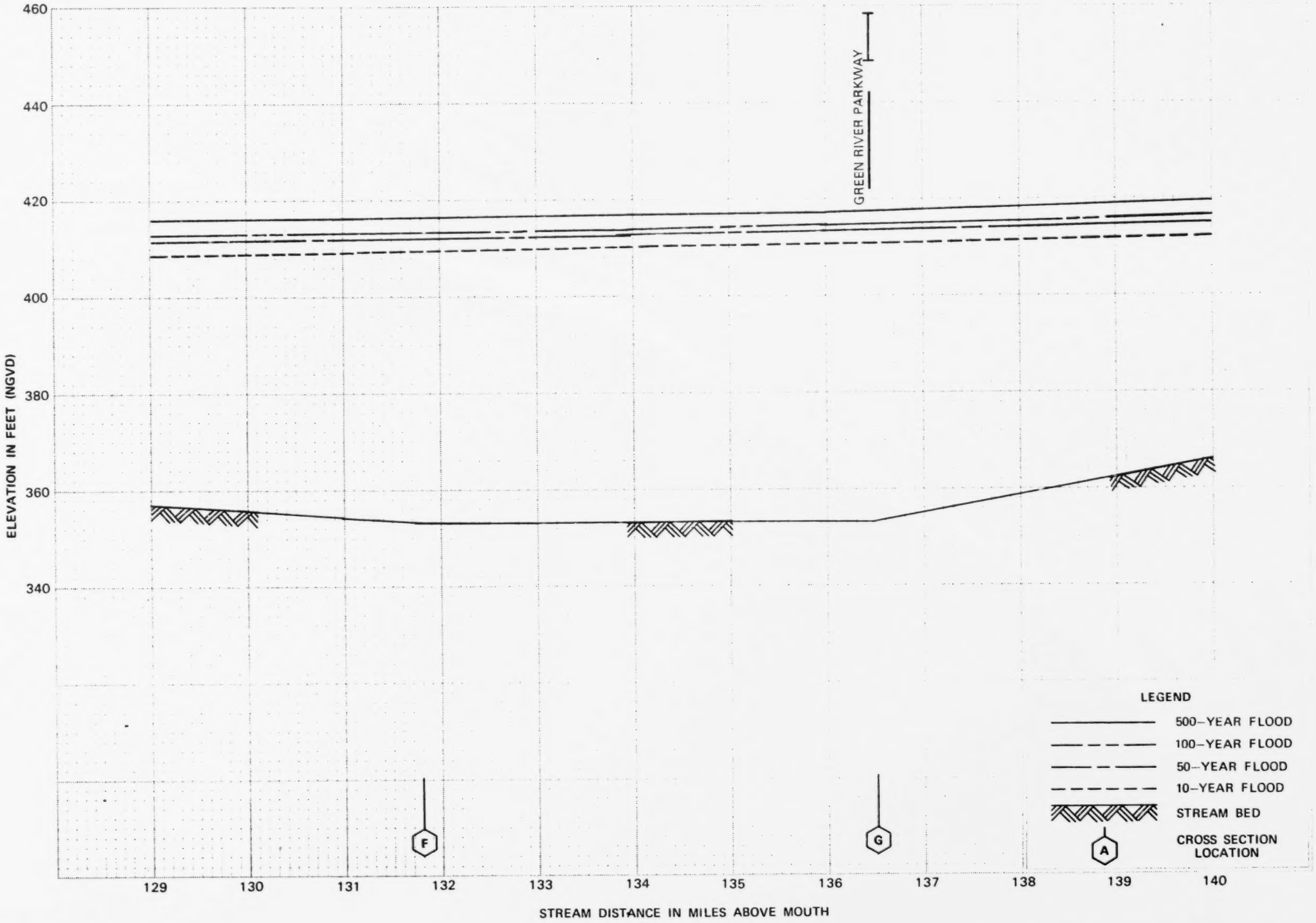
FLOOD PROFILES

GREEN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

02P



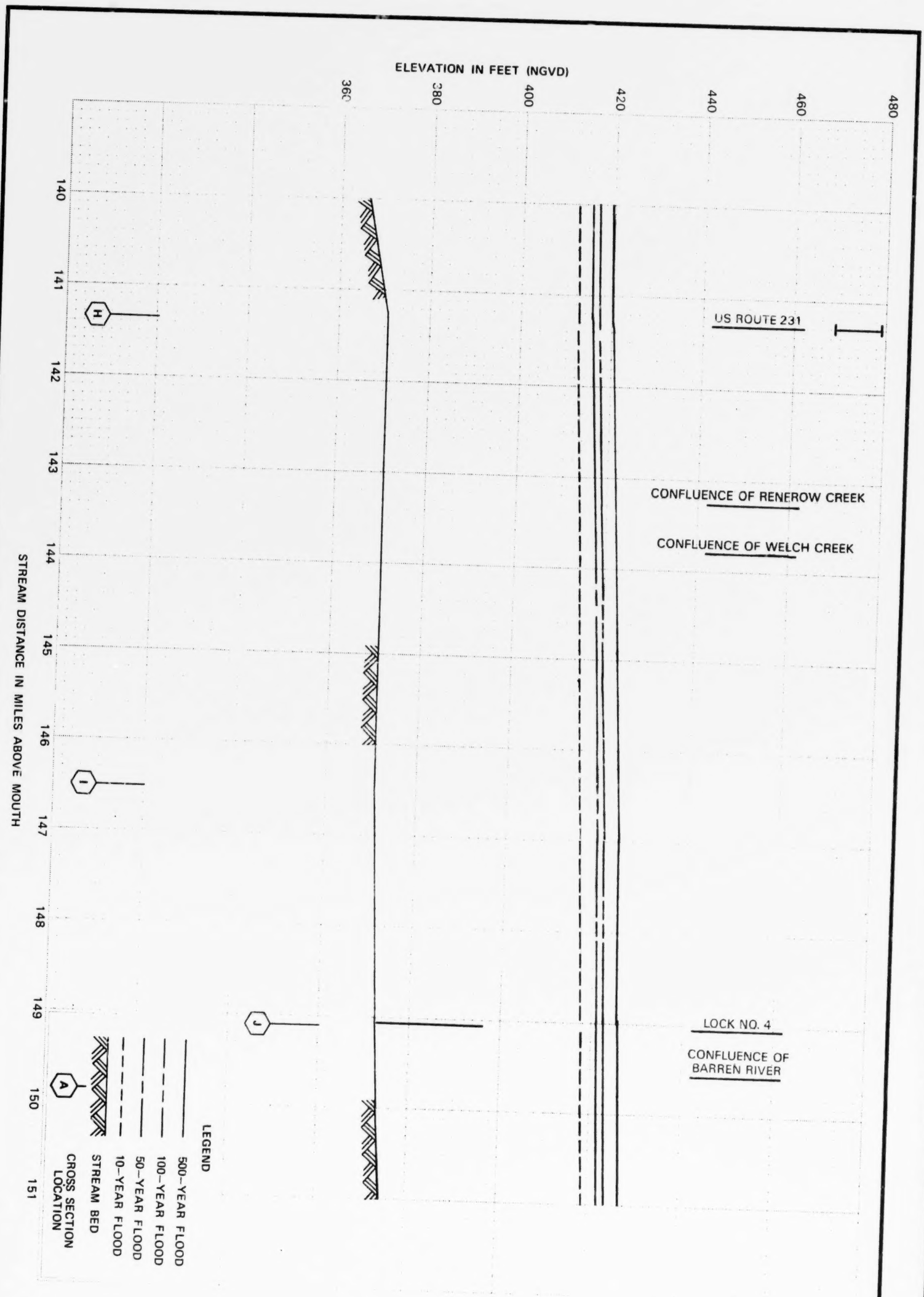
FLOOD PROFILES

GREEN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

03P



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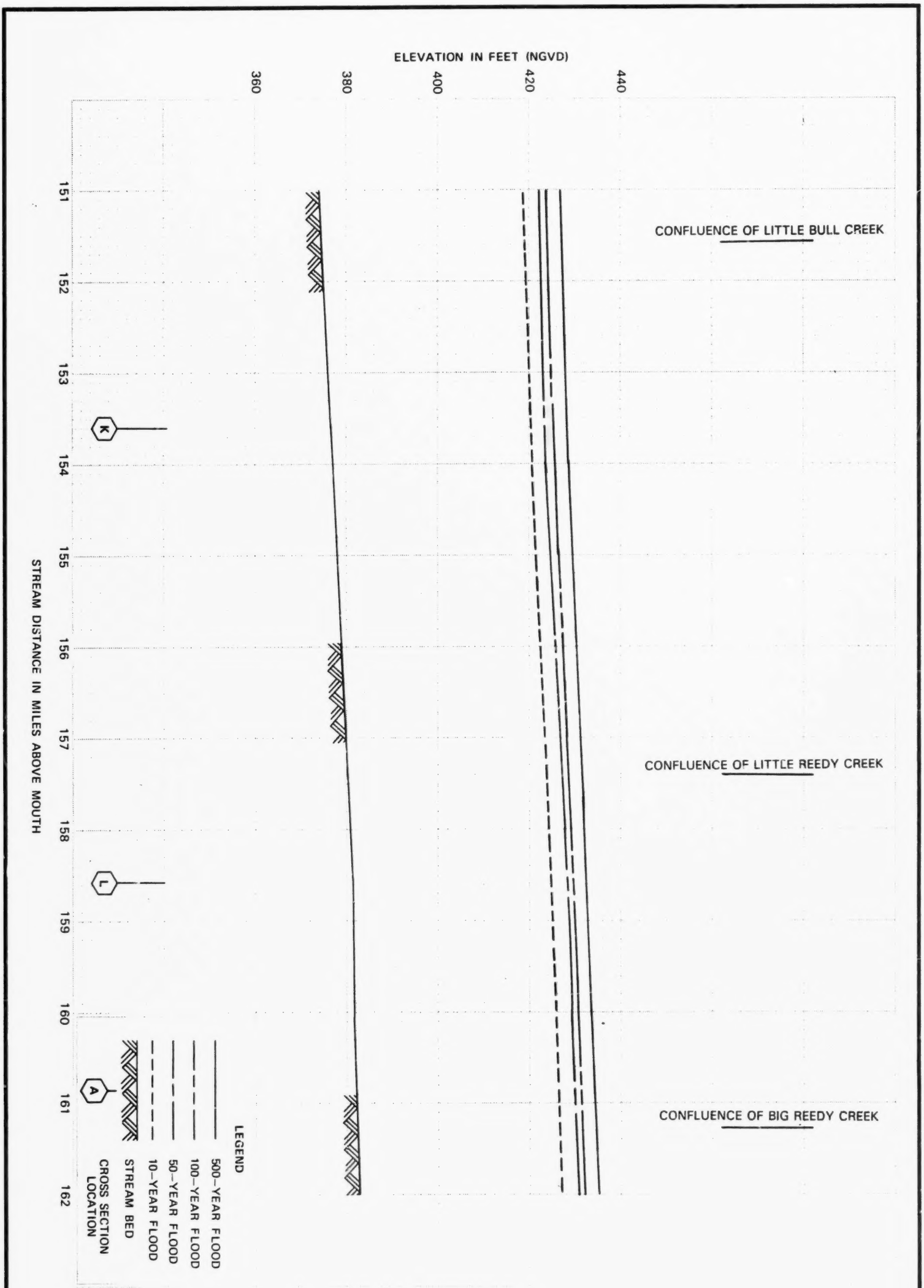
FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

FLOOD PROFILES

GREEN RIVER



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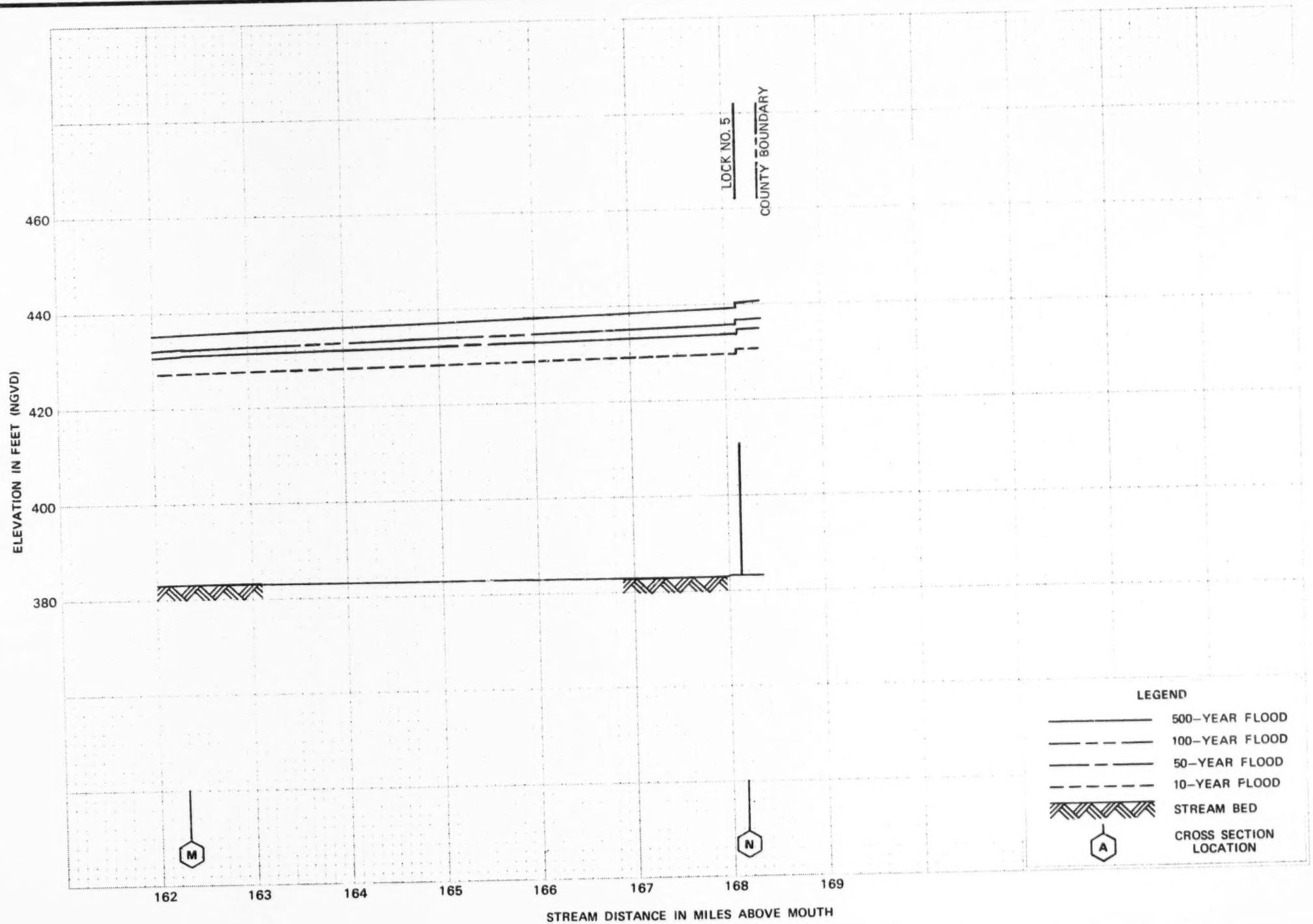
FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

FLOOD PROFILES

GREEN RIVER



FLOOD PROFILES

GREEN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

BUTLER COUNTY, KY
(UNINCORPORATED AREAS)

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